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Organizadores
Roberto Giolo de Almeida (Coordenador)
Patrícia Perondi Anchão Oliveira
Maurício Saito
Cleber Oliveira Soares
Lucas Galvan
Lucimara Chiari
Fabiana Villa Alves
Davi José Bungenstab

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Fone: (67) 3368 2000

Fax: (67) 3368 2150

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Beef cattle productivity in grazing systems with different levels of intensification

Rosana R. CORTE^{1}, Saulo L. SILVA¹, André F. PEDROSO², Renata T. NASSU², Rymer TULLIO², Alexandre BERNDT², Leandro S. SAKAMOTO², Paulo H.M. RODRIGUES¹, Patrícia P.A. OLIVEIRA²*

¹Faculty of Animal Science and Food Engineer, University of Sao Paulo, Pirassununga, Brazil;

²Embrapa Southeast Livestock, São Carlos, São Paulo, Brazil; rs corte@usp.br*

Introduction

The intensification of livestock production in tropical grazing areas should be based on the best use of the potential of pasture growth with a sustainability focus.

Livestock production is growing worldwide due to increased demand for animal protein. Beef cattle production worldwide has increased almost 40% in the last three decades, Americas being one of the regions which led this development (FAO, 2013). At the same time, the need to reduce the sector's greenhouse gas emissions and its overall environmental footprint has become a top priority for industry and policy makers (Gerber et al., 2013). Therefore, the objective of this research was to assess beef cattle productivity in grazing systems with different levels of intensification.

Material and Methods

The grazing experiment was conducted from March 2012 to August 2013 with 24 Nelore steers (292.8 ± 1.28 kg of live weight - LW; 15 months old). Animals were allotted to four grazing systems with two area replications (blocks), at an experimental station of the Brazilian Agricultural Research Corporation (EMBRAPA), Southeast of Brazil 1) DP: degraded pasture (1.1 animal units - AU/ha; *Brachiaria decumbens*); 2) IHS: irrigated pasture with high stocking

rate (5.9 AU/ha; *Panicum maximum*); 3) DHS: dryland pasture with highstocking rate (4.9 AU/ha; *Panicum maximum*), 4) DMS: dryland pasture with moderate stocking rate (3.4 AU/ha; *Brachiaria brizantha*). Pasture in IHS DHS and DMS systems were fertilized with 600, 400 and 200 kg N year⁻¹, respectively. The irrigated pastures were overseeded with *Avena byzantina* cv. São Carlos (60kg/ha) and *Lolium multiflorum* Lan. cv. BRS Ponteio (30 kg/ha), in 06/01/2012 and 04/22/2013. With exception of the degraded pasture, all pastures were managed in a rotational grazing system. Three steers were used to evaluate performance in each system (testers) and regulating animals were used to adjust the stocking rate using the "put and take" technique (Mott and Lucas, 1952) and visual evaluation of forage availability. Animals were slaughtered with approximately 450 kg of LW. Data were analyzed as completely randomized block design using PROC MIXED.

Results and Conclusions

As expected, IHS system presented higher stocking rate (6.9 AU/ha) and higher animal productivity (Table 1) due to higher amount of N applied, irrigation and the overseeding with winter grasses, resulting in higher availability of forage in the pasture. Systems DHS and DMS presented similar and intermediary stocking rates and productivity. The DP system resulted in the lower stocking rate and productivity when compared to all others. Overall, animal productivity increased as the intensification of the systems increased. Similarly, Barcellos et al. (1999) verified lower carcass yield (51 kg/ha/year) for animals grazing degraded pasture when compared to those kept in pasture under recovery (310.5 kg/ha/year).

Besides the very low productivity observed in the degraded pasture, there is a strong relation between GHG emissions by plants and soil, especially CO₂, and the degradation process of pastures (Oliveira, 2015). According to Primavesi (2007), degradation of farmland causes soil compaction, reducing aeration and water infiltration, with higher potential for GHG emission; the exposed soil allows greater thermal amplitude which accelerates the degradation process.

Table 1. Nelore steers productivity in grazing systems with different levels of intensification (least square means $\pm$ -).

Item*	DP [†]	IHS [†]	DHS [†]	DMS [†]	SEM	P level
Stocking rate (AU/ha)	1.7 ^c	6.9 ^a	5.2 ^b	4.0 ^b	0.79	0.0008
Live BW (kg/ha/year)	231.6 ^c	993.3 ^a	697.0 ^b	533.0 ^b	60.40	0.0079
Carcass (kg/ha/year)	124.6 ^c	570.6 ^a	395.4 ^b	301.7 ^b	32.48	0.0057
CEP (kg/ha/year)	112.0 ^c	531.0 ^a	374.2 ^b	280.5 ^b	32.46	0.0076

a,b Means within a row with unlike letters differ at $P \leq 0.05$; SEM: standard error of the mean.

*BW: body weight; CEP: carcass edible portion.

[†] DP: degraded pasture; IAL: irrigated pasture with high stocking rate; DHS: dryland pasture with high stocking rate; DMS: dryland pasture with moderate stocking rate.

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